

## DANCE SHOE AND LAST FOR MAKING A DANCE SHOE

### FIELD OF THE INVENTION

[0001] The present invention generally relates to dance shoes and more particularly relates to dance shoes that facilitate moving a foot into a point position.

### BACKGROUND OF THE INVENTION

[0002] When dancing, an individual's feet are placed in many different positions, including the rest position, the flex position, the point position and the toe position. When in the point position, a foot must be arched with the toes pointing toward the ground. As is well known to those skilled in the art, an arched foot typically has a curve on the bottom of the foot and a corresponding curve at the top or instep of the foot. In the dancing arts, many refer to an arched foot as a "banana foot."

[0003] Although many dancers develop extraordinary abilities, some may be precluded from advancing in their chosen field because they are unable to form an aesthetically pleasing arch when in the point position. Thus, there have been a number of advances in the dance shoe art related to presenting a foot in an aesthetically pleasing arch position. For example, U.S. Patent Application Publication No. 2003/0033729 to Farrior discloses an apparatus and method for augmenting a dancer's foot whereby a pad having a curved top surface is attached to the top of a dancer's foot. As a result, the shape of the top of the dancer's foot is more aesthetically pleasing.

[0004] U.S. Patent No. 1,553,196 to Solomonoff discloses a toe dancer's shoe that enables a dancer to assume a toe position. Referring to FIGS. 1-2, the shoe 10 has an upper 12 made of fabric material and a drawstring 15 for adjusting and tightening the shoe. The shoe 10 includes a toe portion 16 and padding material 17. The shoe 10 also includes a stiffened inner sole 21 that

facilitates formation of an extremely arched foot position. The shoe also has an additional arcuate-shaped, stiffening sole 22 that is attached to the stiffened inner sole 21. One drawback of the '196 patent is that the sole is inflexible, which prevents a dancer's foot from moving freely between the rest, flex, point and toe positions.

[0005] U.S. Patent No. 5,649,373 to Winter et al. discloses a shoe structure having an elongate flat leaf spring element provided in the sole of the shoe. The elongate leaf spring extends from the toe region of the shoe structure beyond the location of the metatarsal-phalangeal (M-P) joints of the wearer, so as to provide a mechanical power assist to the wearer at the M-P joints.

[0006] In spite of the advances discussed above, none of the above-identified references teach providing a dance shoe having a flexible sole that is designed to normally urge the foot to move into the point position. In addition, none of the references teach a dance shoe having a toe region with zero or negative toe spring so that the shoe upper and sole cooperate for urging the toes of an inserted foot to move downward. Moreover, none of the references teach a dance shoe having a flexible sole that facilitates forming an aesthetically pleasing arch when a foot is in a point position. Thus, there is a need for a dance shoe that satisfies these needs.

#### SUMMARY OF THE INVENTION

[0007] In accordance with certain preferred embodiments of the present invention, a dance shoe adapted for urging a foot into an arch shape includes a shoe upper and a sole attached to the shoe upper. The sole preferably includes a heel region, a toe region and an arch extending between the heel region and the toe region, whereby a bottom of the heel region defines a horizontally extending ground plane. The arch is desirably sufficiently curved so that at least a portion of the toe region of the dance shoe is

projected downwardly below the horizontally extending ground plane. The sole may be flexible. In certain preferred embodiments, the toe region of the sole has no toe spring relative to the horizontally extending ground plane. In other preferred embodiments, the toe region of the sole has negative toe spring relative to the horizontally extending ground plane. When a dancer's foot having toes is inserted into the dance shoe of the present invention, the shoe upper and the sole cooperate for urging the dancer's toes downwardly and the foot to assume an aesthetically pleasing arch position.

[0008] The sole of the dance shoe is desirably made of a material selected from the group consisting of rubber, polymer and leather. In highly preferred embodiments, the sole is flexible. The upper of the shoe is desirably made of flexible materials such as fabric. In preferred embodiments, the shoe upper is made of materials including GORE®, LYCRA®, mesh fabric, stretchable fabric, leather, cotton fabric, synthetic fabric, and polymer fabric.

[0009] In another preferred embodiment of the present invention, a dance shoe adapted for urging a foot into a point position includes a shoe upper and a flexible sole attached to the shoe upper. The sole desirably has a heel region, a toe region and an arch extending between the heel region and the toe region. A bottom of the heel preferably defines a horizontally extending ground plane. The toe region of the sole preferably has at least zero toe spring and the arch is sufficiently curved so that the toe region is projected downwardly below the horizontally extending ground plane. In other preferred embodiments, the toe region of the sole has negative toe spring.

[0010] In still other preferred embodiments of the present invention, a dance shoe designed for normally urging a foot into a point position includes a flexible sole having a heel region, a toe region and an arch extending between the heel region and the toe region,

wherein the toe region of the sole has a negative toe spring. The dance shoe also preferably includes a shoe upper attached to the sole, whereby the sole and the upper cooperate for urging a dancer's foot inserted into the dance shoe to move into the point position.

[0011] In yet another preferred embodiment of the present invention, a dance shoe includes a flexible sole having a heel region, a toe region remote from the heel region, an arch between the heel region and the toe region and a ball region between the arch region and the toe region. The dance shoe also preferably includes a shoe upper attached to the sole, whereby the toe region of the flexible sole has no toe spring. In other preferred embodiments, the toe region of the flexible sole has negative toe spring so that when a dancer's foot having toes is inserted into the dance shoe, the shoe upper and the sole cooperate for urging the dancer's toes downwardly.

[0012] These and other preferred embodiments of the present invention will be described in more detail below.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0013] FIG. 1A shows a foot of a dancer in a rest position.

[0014] FIG. 1B shows a foot of a dancer in a flex position.

[0015] FIG. 1C shows a foot of a dancer in a point position.

[0016] FIG. 1D shows a foot of a dancer in a toe position.

[0017] FIG. 2 shows a foot of a dancer in a point position.

[0018] FIG. 3 shows a prior art dance shoe with the foot of a dancer in the point position.

[0019] FIG. 4 shows a prior art shoe having toe spring.

[0020] FIG. 5 shows a cross-sectional view of a shoe last for a dance shoe, in accordance with certain preferred embodiments of the present invention.

[0021] FIG. 6A shows a side elevational view of a shoe last for a dance shoe, in accordance with certain preferred embodiments of the present invention.

[0022] FIG. 6B shows a perspective view of the shoe last of FIG. 6A.

[0023] FIG. 6C shows another side view of the shoe last of FIG. 6A.

[0024] FIG. 6D shows an underside of the shoe last of FIG. 6A.

[0025] FIG. 6E shows a bottom view of the shoe last of FIG. 6A.

[0026] FIG. 6F shows a front elevational view of the shoe last of FIG. 6A.

[0027] FIG. 6G shows a top plan view of the shoe last of FIG. 6A.

[0028] FIG. 7 shows a dance shoe made using the shoe last of FIGS. 6A-6F, in accordance with certain preferred embodiments of the present invention.

[0029] FIG. 8 shows a dance shoe made using the shoe last of FIGS. 6A-6F, in accordance with still other preferred embodiments of the present invention.

[0030] FIG. 9 shows a dance shoe made using the shoe last of FIGS. 6A-6F, in accordance with yet further preferred embodiments of the present invention.

#### DETAILED DESCRIPTION

[0031] When dancing, an individual's feet must be placed in many different positions. FIG. 1A shows a foot in a rest position whereby both a heel 22 and a ball region 24 of a shoe 20 are in contact with a ground plane 26. In the rest position, the foot is relaxed and the shoe 20 generally maintains the foot in the relaxed position. FIG. 1B shows a foot in a flexed position with the ball 24 of shoe 20 flexed so that heel 22 may be

lifted off the ground plane 26. FIG. 1C shows a foot in a point position with a toe 28 of shoe 20 engaging ground plane 26 and an arch 30 formed between the heel 22 and the ball region 24. The top of the foot, commonly referred to as the instep 31, is also curved. In order to move a foot into a point position, the muscles of the foot must be used to curve the shoe sole from the normal position shown in FIG. 1A to the arched position shown in FIG. 1C. FIG. 1D shows a foot in the toe position, with the toe 28 of the shoe 20 engaging the ground plane 26 and the heel 22 lifted off of the ground plane 26. In the toe position, the protracted arch attained in the point position (FIG. 1C) is no longer apparent.

[0032] FIG. 2 shows a bare, human foot 32 having a heel 34, a toe region 36, a ball region 38 and an arch 40. The foot is configured in what is commonly referred to as the point position, one of the most aesthetically pleasing positions in dance. In the point position, the arch 40 and the instep 42 are curved and the toes 36 are pointed downwardly.

[0033] FIG. 3 shows the foot of FIG. 2 positioned in a prior art dance shoe 44. The shoe is primarily shaped to accommodate a foot that is in the rest position (FIG. 1A). This is due, in part, to the fact that shoes are generally manufactured using lasts that are modeled after a foot in a rest position.

[0034] FIG. 3 shows some of the problems associated with prior art dance shoes that are designed for feet in the rest position. First, when a foot is placed in the point position, wrinkles 46 develop in the fabric of the upper located near the arch region 45 of the shoe 44. Wrinkles 48 also develop in the toe region of the shoe. Moreover, the tape 50 around the shoe opening will typically pinch the dancer's ankle at the points designated 52 and 54. Gaps also tend to develop between the dancer's heel and the heel of the shoe, as well as

between the ball of the dancer's foot and the ball region of the sole of the shoe. In addition, if laces for the shoe have been tightened, a lace region 56 of the shoe may apply pressure on the instep of the foot.

[0035] FIG. 4 shows a prior art shoe 43 having a sole 45 with an upwardly turned sole in the toe region 47. An upwardly turned sole in the toe region is typically referred to as toe spring. A shoe with toe spring urges a wearer's toes upwardly and provides resistance against a dancer's efforts to move the foot into the point position. The present invention provides a shoe that eliminates many of the obstacles that stand in the way of moving a dance shoe and foot into a point position.

[0036] FIG. 5 shows a last for making a dance shoe, in accordance with certain preferred embodiments of the present invention. The last 58 includes an upper section 60 designed for forming an upper of a shoe. The upper section 60 includes a heel region 62, a toe region 64 and an intermediate region 66 between the heel region and the toe region. The last 58 also includes a lower section 68 designed for forming the sole of a shoe. The lower section 68 includes a heel region 70, a toe region 72, a ball region 74 and an arch region 76. In certain preferred embodiments, the last 58 is specially designed so that it has zero toe spring. As used herein, the terminology "toe spring" means a feature built into a last and shoe to compensate for lack or absence of shoe flexibility at the ball. As is well known to those skilled in the art, the "toe spring" of a shoe creates a rocker effect on the shoe sole so that the shoe forces the foot to "roll" forward like the curved bottom of a rocking chair. Soles that are relatively thicker and/or stiffer than normal require even greater toe spring due to the lack of flexibility of the shoe sole. Moreover, a shoe with toe spring typically causes the toes of the foot to be angled upwardly approximately 5-20°. As will be

described in more detail below, the shoe last of the present invention does not have "toe spring" so that shoes manufactured using the shoe last do not force the toes to tilt upwardly. In some preferred embodiments, the last has "zero toe spring," whereby the toes are not urged upwardly as is common with conventional shoe soles. In other preferred embodiments, the last has "negative toe spring" so that a shoe manufactured using the last urges the toes downwardly such as into an aesthetically pleasing point position.

[0037] Referring to FIG. 5, a shoe last 58 having negative toe spring is positioned over an imaginary, horizontally extending ground plane designated by reference numeral 78. The bottom of heel region 70 is positioned in substantial alignment with the ground plane 78, whereby at least a portion of the toe region 72 of the last 58 projects downwardly below the ground plane 78. Thus, the toe region of the shoe last 58 has negative toe spring. In contrast, if the toe region 72 projected above the ground plane 78 as shown in FIG. 4, then the toe region would have a positive toe spring.

[0038] FIGS. 6A-6G show a shoe last, in accordance with another preferred embodiment of the present invention. Referring to FIGS. 6A and 6B, the shoe last includes an upper section 160 adapted for forming an upper of a shoe. The upper section 160 includes a heel region 162, a toe region 164 and an intermediate region 166. The shoe last 158 also includes a lower section 168 adapted for forming a sole of a shoe. The lower section 168 includes a heel region 170, a toe region 172 and a ball region 174. The lower section 168 also includes an arch 176. The last is designed to manufacture a shoe having a negative toe spring so as to encourage a foot to move into a point position. As such, when an imaginary, horizontally extending ground plane 178 is placed in substantial alignment with a bottom of heel region 170 at an underside



of the last 158, the ground plane 178 extends through at least a portion of the toe region 172 of the sole.

[0039] Referring to FIGS. 6C and 6D, in one preferred embodiment of the present invention, a last 158 for a size 7M shoe has a heel length A of approximately 2.0-2.20 inches and more preferably about 2.10-2.15 inches in length, an arch length B of approximately 3.50-3.70 inches and more preferably about 3.60-3.65 inches, and an arch depth C measured from apex D to imaginary line E of approximately .45-.50 inches and more preferably about .47 inches. The last also has a toe length F extending between the toe of the last and the forward end of the arch of approximately 3.15-3.20 inches and more preferably about 3.19 inches in length. The last 158 also has a toe height G of approximately 0.90-1.00 inches and more preferably about 0.94 inches, an instep circumference H of approximately 8.15-8.20 inches and more preferably about 8.19 inches, and an instep length I of approximately 6.45-6.55 inches and more preferably about 6.50 inches in length. The last 158 also has a quarter or heel height J of approximately 2.55-2.65 inches and more preferably about 2.60 inches.

[0040] Referring to FIG. 6D, last 158 has a heel width K of approximately 2.15-2.25 inches and more preferably about 2.20 inches. Referring to FIG. 6E, last 158 has an overall length L of approximately 8.90-9.00 inches and more preferably about 8.94 inches. At the ball region 174 of last 158, the last has a width M of approximately 2.90-3.00 inches and more preferably about 2.95 inches. FIG. 6F shows a front elevational view of last 158 having a toe height G of approximately 0.90-1.00 inches and more preferably about 0.95 inches. FIG. 6G shows a top plan view of last 158.

[0041] FIG. 7 shows a dance shoe 258, in accordance with certain preferred embodiments of the present invention. The dance shoe 258 includes a shoe upper 260

and a flexible sole 268 having a heel region 270, a toe region 272 and a ball region 274. When the bottom of heel region 270 is placed in substantially parallel alignment with imaginary, horizontally extending ground plane 278, at least a portion of the toe region 272 of the sole projects through the imaginary plane 278. As a result, the dance shoe 258 has negative toe spring, which normally urges a wearer's foot to move downwardly into a point position. Specifically, the shoe urges a wearer's toes to move downwardly. Moreover, the shoe preferably urges the wearer's foot to move into an arch position. Moreover, since the sole 268 is designed to have a negative toe spring, the upper 260 attached to the sole will be devoid of wrinkles that typically appear in the upper material located above the arch 276, as well as in the upper material located around the toe 272. Although not limited by any particular theory of operation, it is believed that the dance shoe of the present invention normally urges an at rest foot to move toward the point position. As a result, the shoe does not provide the level of resistance found in prior art shoes as the dancer attempts to move the foot into the point position. In addition, the shoe has a more aesthetically pleasing appearance when in the point position because the upper of the shoe does not wrinkle and/or buckle as is found in prior art shoes.

[0042] FIG. 8 shows a dance shoe 358 in accordance with another preferred embodiments of the present invention. The dance shoe 358 includes a shoe upper 360 and a sole 368 having a heel region 370, a toe region 372 and a ball region 374. When the bottom of heel region 370 is placed in substantially parallel alignment with imaginary, horizontally extending ground plane 378, at least a portion of the toe region 372 of the sole projects through the imaginary plane 378. As a result, the dance shoe 358 has negative toe spring, which normally urges a wearer's foot to move downwardly into a point position.

[0043] FIG. 9 shows a dance shoe 458 in accordance with another preferred embodiments of the present invention. The dance shoe 458 has a shoe upper 460 and a sole 468 having a heel region 470, a toe region 472 and a ball region 474. When the bottom of heel region 470 is placed in substantially parallel alignment with imaginary, horizontally extending ground plane 478, at least a portion of the toe region 472 of the sole projects through the imaginary plane 478. As a result, the dance shoe 458 has negative toe spring, which normally urges a wearer's foot to move downwardly into a point position.

[0044] Although the present invention is not limited by any particular theory of operation, it is believed that providing a shoe having a negative toe spring will facilitate movement of the foot into the point position. Providing such a shoe will also prevent wrinkling of the material in the upper of the shoe when the foot is in the point position because the upper material is attached to the sole when the sole has a negative toe spring configuration. Moreover, it is believed that providing a dance shoe with negative toe spring will urge the foot to move into a point position, even when a wearer's foot is at rest. Moreover, because the shoe does not resist a wearer's efforts to move to the point position, moving the foot into the point position will be easier. In addition, the aesthetic appearance of a dancer's foot will be enhanced and the shoe will help provide the protracted arch sought by dancers.

[0045] Although the invention herein has been described with reference to particular embodiments, it is to be understood that these embodiments are merely illustrative of the principles and applications of the present invention. It is therefore to be understood that numerous modifications may be made to the illustrative embodiments and that other arrangements may be devised without

departing from the spirit and scope of the present invention as defined by the appended claims.